

1.4 Cardiovascular Diseases and Disorders



The traditional diet of Inuit people living in coastal communities has centred on fish like arctic char and marine mammals including seals, walruses, and whales. These trends even extend to traditional snack food. Maktaaq, which is whale skin attached to a few centimetres of insulating fat, or blubber, is considered to be one of the finest delicacies in the traditional Inuit diet because it is so delicious. Sometimes maktaaq is consumed immediately after the kill as the whale is being brought ashore, while other times the maktaaq and other whale foods are allowed to freeze and are then buried in snow-covered food caches for later use.

Nutritionists and medical researchers began to collect data in the 1970s about the eating habits and the incidences of illness and disease in traditional Inuit communities. The results of these studies were surprising. Even though fat from marine mammals was a staple of a traditional Inuit diet, the incidence of **cardiovascular disease** in the population was very low. This data stands in sharp contrast to data gathered from communities outside of the Arctic where a high-fat diet coincided with higher rates of cardiovascular diseases.

▶ **cardiovascular disease:** one of many disorders—coronary heart disease, strokes, and varicose veins—that affect the heart and/or the blood vessels



Figure A1.12: Maktaaq is an Inuit delicacy.

If the Inuit diet is so high in fat, why is there such a low incidence of cardiovascular disease among Inuit who follow a traditional lifestyle?

The full answer is still under investigation, but as you will see in this lesson the preliminary findings are quite intriguing. To understand better the results of the early investigations, you will need to learn about the causes of some major cardiovascular diseases, the different types of fat that are part of your diet, and the **traditional ecological knowledge** of Canada's Inuit.

► **traditional ecological knowledge:** the accumulated observations and understanding of the people living within an area, acquired over many hundreds of years through direct contact with the environment

Incorporating traditional ecological knowledge involves developing an understanding of human interactions with the environment and focusing on the inseparable relationship among land, resources, and culture.



Practice

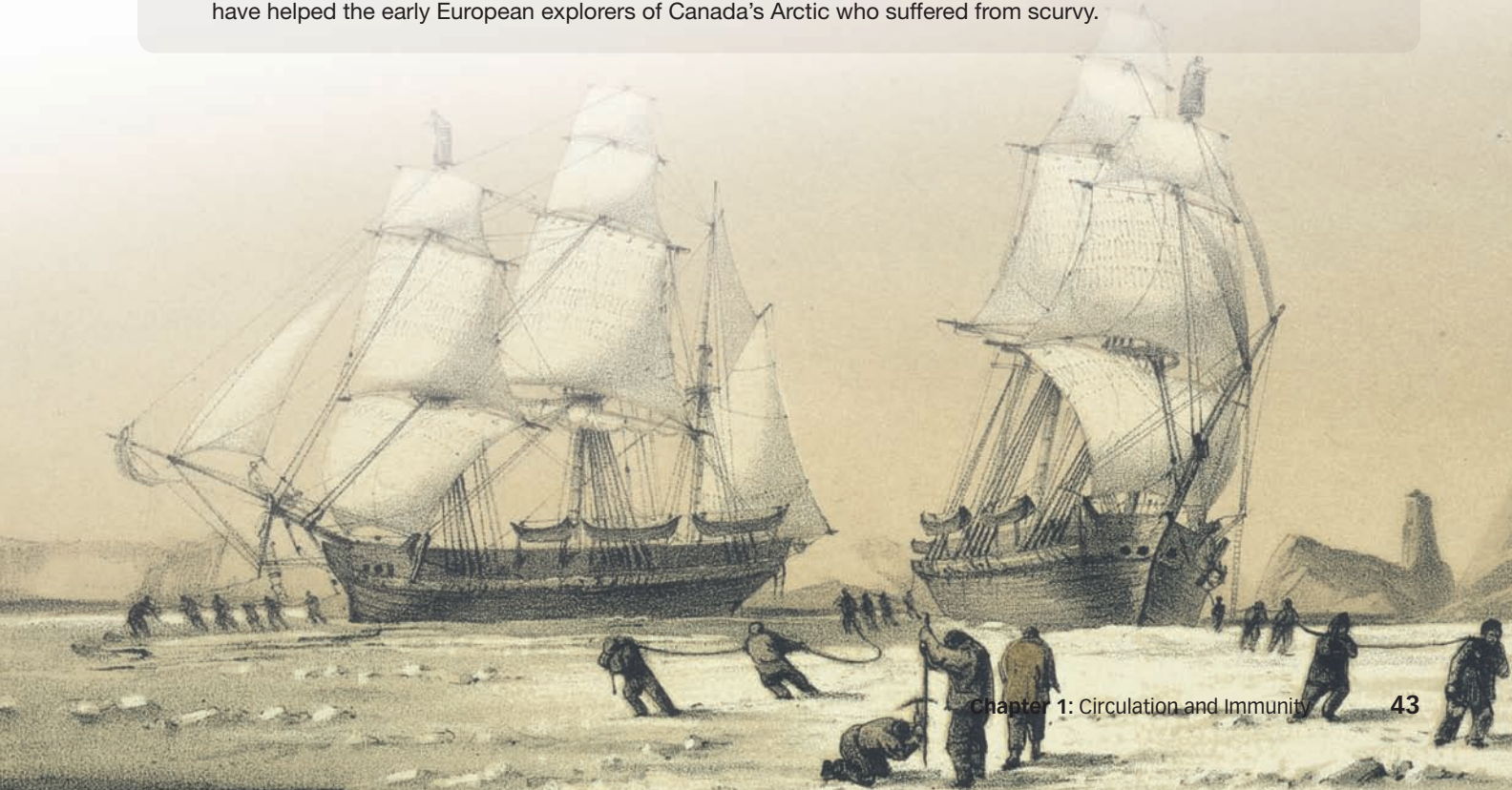
In the 1700s, many Europeans who came to the Arctic to explore or hunt whales began to get a disease called scurvy after spending many months in the far north. Scurvy is a connective-tissue disease that is thought to be the number one cause of deaths at sea in the age of sail. Scurvy symptoms include pale skin, sunken eyes, tender gums, tooth loss, internal bleeding, and a physical and mental deterioration of the body that frequently leads to death.

It was eventually discovered that having fresh fruit and vegetables aboard ships prevented scurvy. The nickname of *limey* for a British sailor comes from the use of limes on British ships to prevent scurvy. It was not until 1932 that medical science established the biochemical cause of scurvy.

Meanwhile, Inuit people who lived their entire lives in the Arctic environment did not have access to fresh fruit and vegetables, but they did not suffer from scurvy.

Use the Internet to gather information to help you answer the following questions.

31. Identify the essential nutrient linked to the cause of scurvy. Explain why it affected sailors, explorers, and whalers on long voyages during the 1700s.
32. How did maktaaq play a key role in preventing scurvy within the Inuit population?
33. Prior to the use of limes and other fresh fruit, explain how the traditional ecological knowledge of the Inuit could have helped the early European explorers of Canada's Arctic who suffered from scurvy.



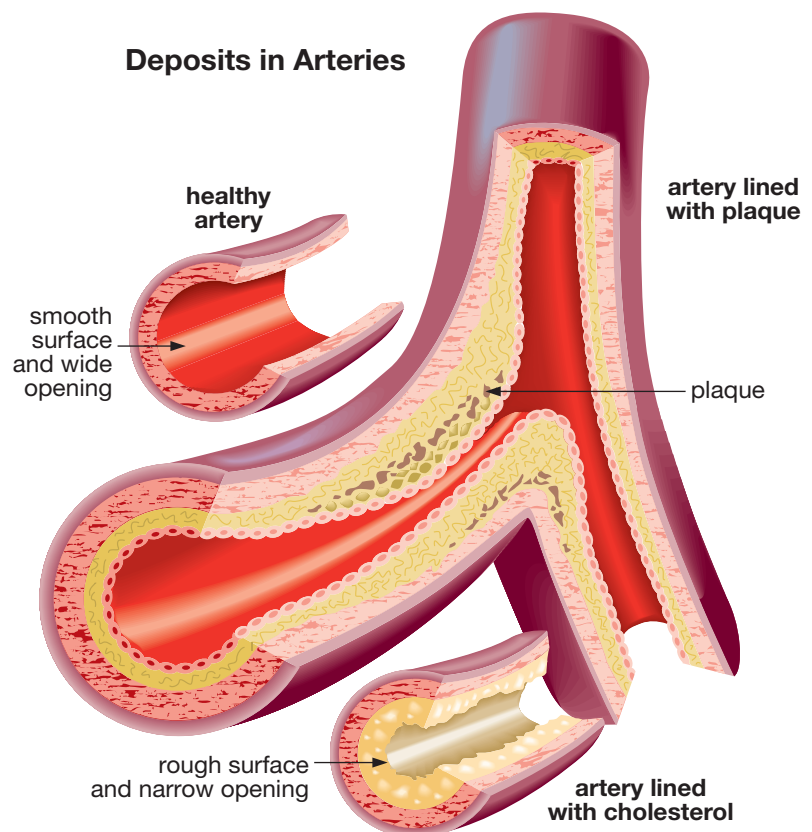
Cardiovascular Diseases and Cholesterol

As the terms *cardio* + *vascular* suggest, cardiovascular diseases are disorders of the heart + blood vessels. As shown in Figure A1.13, cardiovascular diseases include a wide range of disorders.

| Cardiovascular Disease | Description of Disorder | Heart Disease | Blood Vessel Disease |
|------------------------|--|---------------|----------------------|
| atherosclerosis | hardening of arteries due to accumulation of fatty deposits | | ✓ |
| coronary heart disease | restricted blood flow through coronary arteries resulting in chest pain and heart attack | ✓ | |
| heart attack | clot in a coronary artery cuts off blood supply to heart muscle and tissue dies | ✓ | |
| stroke | sudden loss of brain function caused by an interruption in blood flow to brain | | ✓ |
| aneurysm | bulging or weakness in wall of artery or vein | | ✓ |
| valvular heart disease | diseases of heart valves leading to narrowing, leaking, or improper closing of valves | ✓ | |
| septal heart defects | opening within septum that allows blood to flow between left and right ventricles of heart | ✓ | |

Figure A1.13

Read through the descriptions of these disorders in Figure A1.13. Note that an interruption of the blood flow through key arteries plays a major role in many of the diseases on this table. In many cases, arteries lose their effectiveness because the blood has too high a concentration of **cholesterol**. Cholesterol is a vital component of all cell membranes and is a key ingredient in the production of important hormones and vitamin D. This essential substance creates problems when its concentration in the bloodstream becomes too high. Accumulated cholesterol deposits build up along with fat and other debris on the inside walls of arteries. Like the sticky film of bacteria that builds up on your teeth before brushing, these sticky deposits in arteries are also called **plaque**. As plaque accumulates, the affected artery starts to narrow. Since the outer layer of plaque can harden into a rough and rigid surface, the artery becomes stiff. The narrowed opening and rough interior makes it more difficult for blood to flow.



- ▶ **cholesterol:** a waxy, fat-like substance present in the cell membrane of every body cell and in food from animal sources
High levels of cholesterol can lead to cardiovascular disease.
- ▶ **plaque:** a semi-hardened accumulation of substances originally suspended in a fluid

Cholesterol and fat are transported by special blood proteins in plasma through the bloodstream. About two-thirds of all the cholesterol in your blood can be found in **low-density lipoprotein (LDL)**. LDL is responsible for carrying cholesterol in the bloodstream from the liver to cells of body tissues. This is the cholesterol that may find its way to the inside walls of blood vessels and lead to plaque. You can see why these particles are often referred to as “bad cholesterol.”

Another blood protein, called **high-density lipoprotein (HDL)**, carries cholesterol to your liver so it can be excreted from your body. Since this protein scours the bloodstream to collect excess cholesterol, it is sometimes called “good cholesterol.”

► **low-density lipoprotein (LDL):** a blood protein that carries cholesterol in the bloodstream from the liver to the rest of the body

Too much LDL in the blood leads to deposits on the walls of arteries, so this is referred to as “bad cholesterol.”

► **high-density lipoprotein (HDL):** a blood protein that carries cholesterol in the bloodstream from the body cells to the liver

High levels of HDL in the blood means it is less likely that deposits will form on the walls of arteries, so this is referred to as “good cholesterol.”

Practice

34. If you were told to make a sandwich that contained no cholesterol, would you choose butter, cheese, ham, peanut butter, or tuna as a filling?
35. The following results come back from two people who just got their blood cholesterol tested.

| Person | Concentration of Cholesterol in the Bloodstream | |
|--------|---|--------------------------------|
| | Low-Density Lipoprotein (LDL) | High-Density Lipoprotein (HDL) |
| A | 3.62 mmol/L | 0.90 mmol/L |
| B | 2.33 mmol/L | 1.94 mmol/L |

- a. Explain what the unit mmol/L means.
- b. Explain which one of these people has the healthier cholesterol levels.

Atherosclerosis and Coronary Heart Disease

Atherosclerosis is the process in which deposits of cholesterol and fatty substances build up on the inside lining of an artery. This buildup results in a loss of elasticity or a hardening of the vessel. This condition may occur in any of the major body arteries.

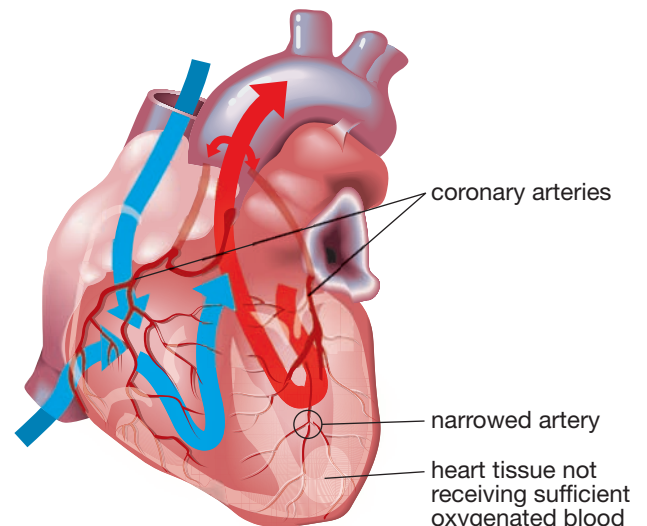
When atherosclerosis affects coronary arteries that supply the heart with blood, complications result that affect the heart muscle’s functioning. In this case, the disease is called **coronary heart disease**. Under these conditions the body’s inability to supply the heart with sufficient oxygen leads to a buildup of toxic wastes. This causes a cramping pain called **angina**, which may begin behind the breastbone and then radiate out to the neck and arms.

► **atherosclerosis:** a hardening of the arteries due to the accumulation of fatty deposits

► **coronary heart disease:** a disease in which blood flow through the coronary arteries is restricted, possibly resulting in chest pain and/or a heart attack

► **angina:** chest pain caused by a narrowing of vessels that supply blood to the heart tissue

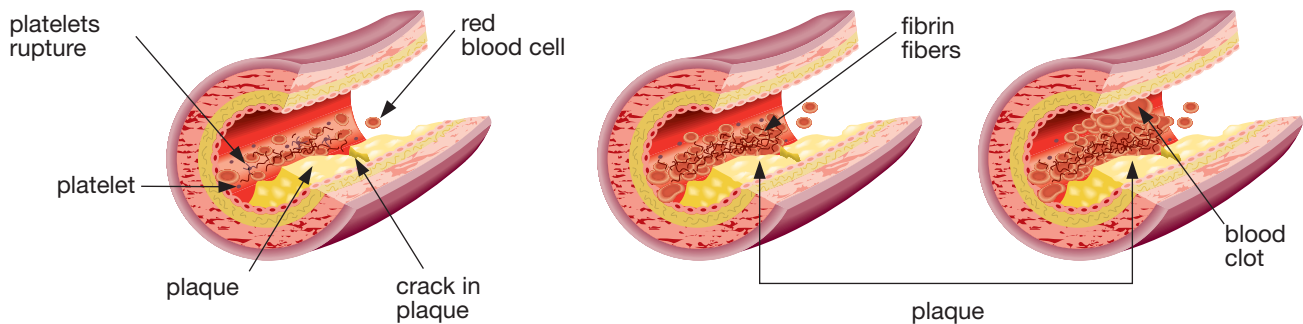
Coronary Heart Disease



Clots, Strokes, and Heart Attacks

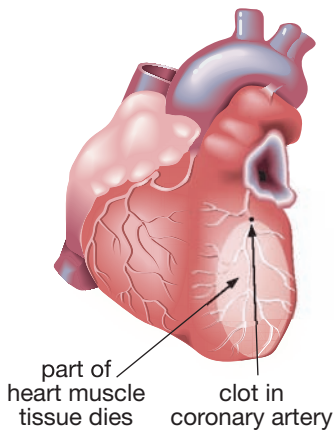
If the plaque coating the artery becomes rough and cracked, platelets passing this area in the bloodstream can rupture and release chemicals that start the clotting process. Fibrinogen in the plasma is converted to thread-like fibrin, and red blood cells become trapped in the fibrin mesh to form a clot. The blood clot can completely block the flow of blood in an artery.

How Plaque in Arteries Promotes Blood Clotting



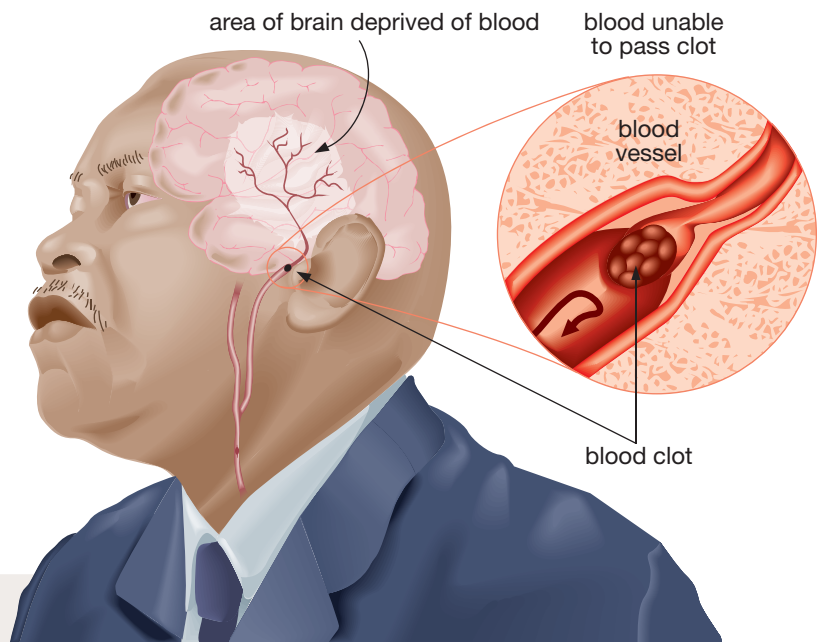
A blood clot in the coronary arteries, which supply the heart with blood, can damage the heart muscle and cause a **heart attack**. In this type of heart attack, cells of the heart muscle die because the clot prevents coronary arteries from supplying blood to those heart cells.

Heart Attack



A blood clot in arteries supplying the brain with blood can cause a **stroke**. In a **stroke**, brain cells die. Memory loss, paralysis, or even death can result.

Stroke



Practice

36. Explain the following statement.

“Cardiovascular disease is a very broad term used to describe a collection of diseases and conditions. In some cases, one cardiovascular disease can cause another cardiovascular disease.”

37. Earlier in this chapter you learned that a stronger heart is not a larger heart but a more elastic one. Elasticity—the ability to return to an initial form after being stretched—is a characteristic of a healthy heart. This same thinking also applies to healthy arteries.

- Describe how the buildup of plaque reduces the elasticity of arteries.
- Explain how the hardening and narrowing of arteries affects blood pressure.

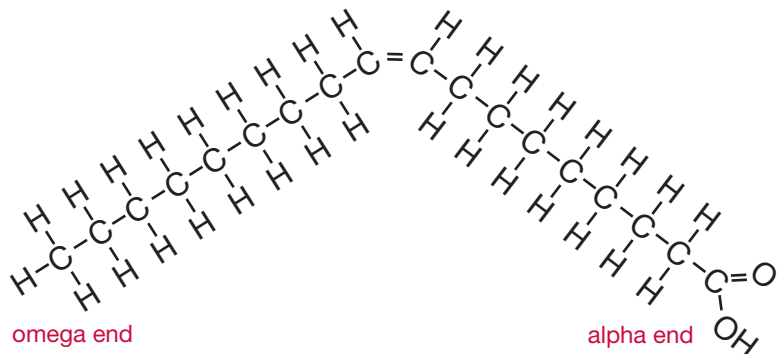
38. Describe how the buildup of plaque on artery walls increases the likelihood of dangerous blood clots forming in the arteries.

► **heart attack:** the death of heart cells due to a blockage in the coronary arteries that supply oxygenated blood to the heart

► **stroke:** a sudden loss of brain function caused by an interruption in the blood flow to the brain

Consider what you have learned so far in Lesson 1.4. Since the buildup of fat and cholesterol within arteries is one of the root causes of many cardiovascular diseases, you might be tempted to think that you should eat a low-fat, low-cholesterol diet. For many years this was considered sound advice for maintaining good health. However, if this were the whole story, how can you explain the fact that Inuit who eat their traditional diet have a very low incidence of cardiovascular disease, even though they obtain more than 50% of their calories from fat? Clearly there is more to this story.

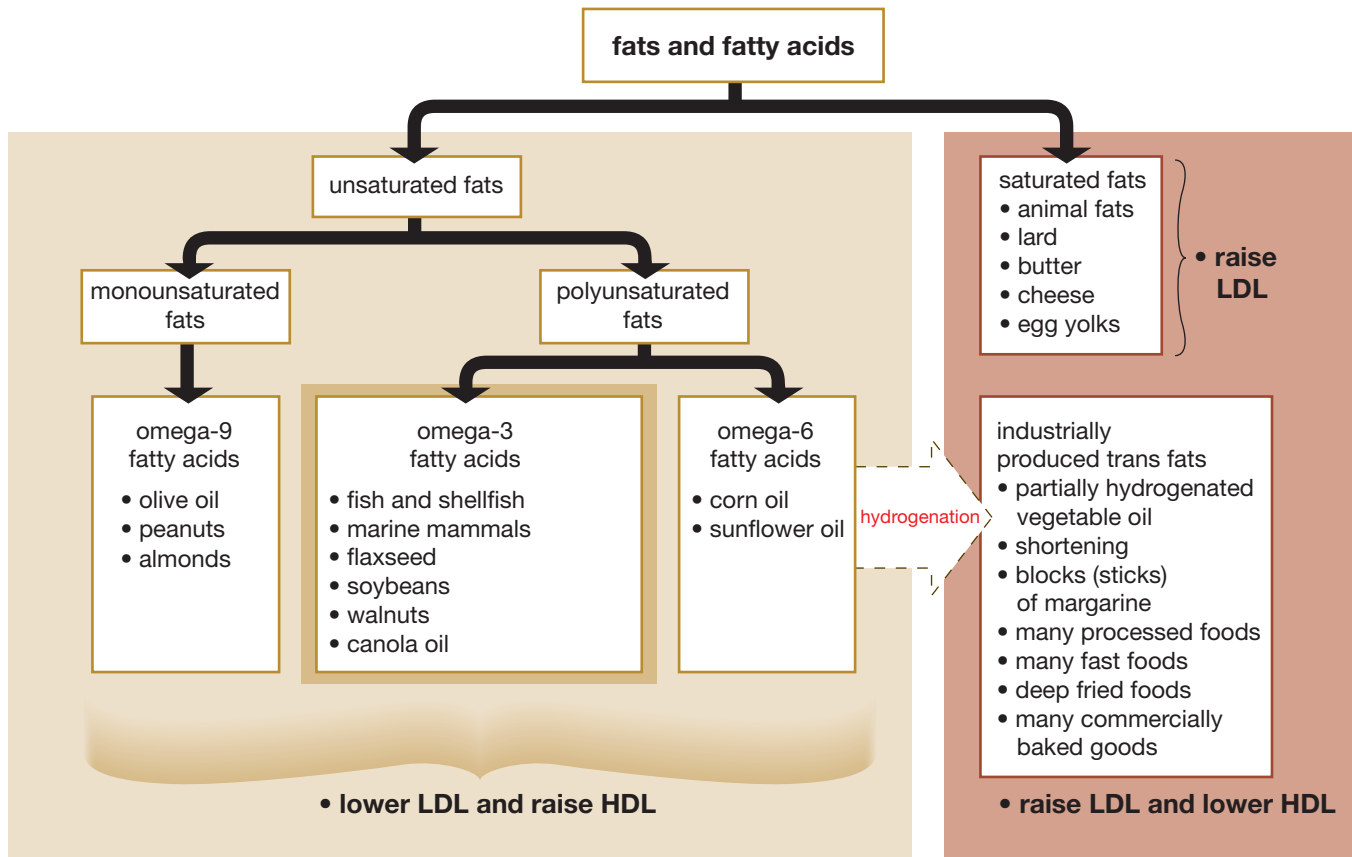
An unsaturated fat is made from long chains of fatty acids in which there is at least one double or triple bond. If there is only one double or triple bond, that fat is classified as monounsaturated. If there is more than one double or triple bond, it is classified as polyunsaturated. As shown in Figure A1.14, the presence of a double or triple bond in unsaturated fatty acids has a profound effect on the structure and, therefore, the properties of these molecules. Note that since the double bond occurs after the ninth carbon from the omega end, oleic acid is referred to as an omega-9 fatty acid.



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So the types of fats and fatty acids you encounter at meal times can be categorized as either saturated or unsaturated. You may also encounter a third category of fats in the industrially produced trans fats. These compounds are created through an industrial process that involves bubbling hydrogen gas through hot vegetable oil under pressure in a special metal vat. In “Classifying Fats and Fatty Acids,” trans fats are shown to be produced from vegetable oils, but they are organized under saturated fats because of the effects that trans fats have on cholesterol in the bloodstream.

Classifying Fats and Fatty Acids



Although this table contains lots of information, there are some important trends worth noting:

- The fats on the right have negative effects on blood cholesterol levels.
- The fats and fatty acids on the left have positive effects on blood cholesterol levels.
- The staple foods in the traditional Inuit diet—marine mammals and fish—are rich sources of omega-3 fatty acids. These substances have a positive effect on blood cholesterol levels.

Essential Fatty Acids

The fats listed on the left side of “Classifying Fats and Fatty Acids” are not only better than those on the right-hand side, but these substances are, in fact, essential for good health. You need these nutrients to form healthy cell membranes, to properly develop the brain and nervous system, and to produce hormone-like substances that regulate body functions (e.g., blood pressure).

essential fatty acid: a fatty acid that the body cannot synthesize itself and must be obtained from food

It is particularly important for you to eat foods with fats and oils that contain the **essential fatty acids** of omega-3 and omega-6. These substances cannot be produced from other substances within your body—you must obtain them from the foods you eat. Although most people have no trouble getting enough omega-6 fatty acids, many individuals find it challenging to obtain an adequate supply of omega-3 fatty acids.

Practice

39. Explain why limiting foods high in cholesterol can have only a limited effect on lowering blood cholesterol levels. Use the information in “Classifying Fats and Fatty Acids” to answer questions 40 and 41.
40. In each part of this question you will be given a meal description. In each case, identify the dominant type of fat or fatty acid consumed and describe the likely effect on blood cholesterol levels.
- a. A day begins with a breakfast of bacon, eggs, and two pieces of buttered toast.
 - b. A snack at a sporting event consists of a large order of deep-fried onion rings, a doughnut, and a large soft drink.
 - c. A lunch at school consists of a tin of flaked tuna, along with a salad made up of fresh vegetables and homemade dressing created from olive oil and spices.
41. Suppose you decide to eliminate nearly all foods that contain fat. The only exception is that once in a while you treat yourself to a plate of fries with gravy from a local diner. Explain the negative impact of this eating pattern.

Heart Healthy Lifestyle



Males, individuals over 65 years of age, and people with a family history of cardiovascular disease are at the greatest risk for developing atherosclerosis and the potentially fatal circulatory problems that result from it. These risk factors cannot be controlled, but there are lifestyle choices that can affect your chances of getting atherosclerosis and related cardiovascular diseases.

If you routinely eat foods high in cholesterol, you may be negatively affecting your blood cholesterol levels. To maintain healthy cholesterol levels, keep in mind that the right mix of fats is actually more important than avoiding foods high in cholesterol. Nutritionists recommend trying to eliminate foods from your diet that contain industrially produced trans fats and add that you should replace foods containing saturated fats with foods that contain unsaturated fats.

People who have high blood cholesterol levels, who are overweight, who engage in little physical activity, who have high blood pressure, or who smoke (or even those exposed to high levels of second-hand tobacco smoke) are at a greater risk of developing circulatory diseases. Stress and excessive alcohol use can also strain the heart and blood vessels to increase the chances of developing a circulatory disorder. Making good lifestyle choices can help to ensure that you reduce the influence of factors that can harm your circulatory system.



DID YOU KNOW?

The number one cause of death in most developed countries is cardiovascular disease. Each year nearly 80 000 Canadians die from heart disease and strokes. This is the equivalent of the entire population of Red Deer.

Try This Activity

Analyzing Nutrition Fact Labels

Purpose

You will analyze nutrition fact labels to determine which foods are best for maintaining cardiovascular health.

Materials

You will need samples of nutrition fact labels from several brands of butter, margarine, and other spreads.

Procedure

- step 1:** Gather the nutrition fact labels from butter, margarine, and other types of spreads that you use most often in your home.
- step 2:** Create a chart to compare these products. The chart should include the product name, serving size, the food energy in calories, total fat, saturated fat, trans fats, cholesterol, fibre, and sodium.

Analysis

- Rank the products in amount of cholesterol per gram of product and amount of saturated fat per gram of product. Identify which of the spreads would be best for someone trying to lower the blood cholesterol level.
- A diet that includes lots of salty food causes sodium levels in the bloodstream to elevate. The body responds by adding more water to the bloodstream in an attempt to dilute the sodium concentration. Therefore, the volume of the blood increases.
 - Explain why a diet that contains many salty foods leads to higher blood pressure levels.
 - Identify which food items are best suited for someone diagnosed with high blood pressure.
- Bile, mostly made of cholesterol, is a substance that helps to digest fat. Soluble fibre is found in foods like apples, brown rice, and beans. When soluble fibre passes through the digestive tract, it can help trap bile in the intestine—this allows bile to be excreted along with other wastes.
 - Explain how soluble fibre helps to reduce blood cholesterol levels.
 - Identify what food items contain significant amounts of fibre.
- Other than differences in dietary content, list some factors that may influence consumer choice in terms of buying one of these products.



Omega-3 Fatty Acids and the Traditional Inuit Diet



Turn back to “Classifying Fats and Fatty Acids,” which compared types of fats and fatty acids in terms of their effects on blood cholesterol levels. Note the location of fish and marine mammals on this table: these foods are rich sources of eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA). These particular omega-3 fatty acids can be derived only from marine sources—you cannot get them from plants or animals that live on land. These substances play a key role in allowing fish and marine mammals to survive in frigid environments. A good rule of thumb is that the colder the water, the greater the concentration of omega-3 fatty acids the fish and other animals can accumulate.



Figure A1.15: Salmon, along with mackerel and sardines, are coldwater fish and are all good sources of omega-3 fatty acids.

At the time this textbook was published, research on the benefits of a diet rich in omega-3 fatty acids from EPA and DHA marine sources was still underway. However, early findings indicate that these substances have a protective effect when it comes to cardiovascular diseases.

Possible Protective Effects of Omega-3 Fatty Acids on Cardiovascular Diseases

- helps prevent chaotic beating of the heart—the largest cause of death for people who have already suffered a heart attack
- reduces clotting of blood
- protects against progression of atherosclerosis by reducing harmful plaque
- reduces inflammation, especially associated with atherosclerosis in coronary arteries
- helps make arteries more supple and elastic
- causes slight reductions in blood pressure

It is important to realize that this research is still in its early stages and that the extent of these possible protective effects is still being investigated. How these protective mechanisms actually work is not yet thoroughly understood. Nevertheless, it does appear that the traditional ecological knowledge of the Inuit and medical science both support the same notion: a diet that contains foods like coldwater fish can have some positive effects on health.



It is also worth noting that the presence of omega-3 fatty acids from marine sources is not the only factor to consider when explaining the low incidence of cardiovascular diseases for Inuit who follow a traditional lifestyle. Genetics may also play a role. In addition, a lot of exercise accompanies the harvesting of food sources in the traditional Inuit diet. As you learned earlier in this chapter, people who include cardiovascular exercise or aerobic training as a part of their daily lives have stronger hearts that don’t need to beat as often to circulate the same amount of blood.

Practice

42. Assume for the purposes of this question that research establishes there will be significant improvements to the cardiovascular health of the general population if people include marine sources of omega-3 fatty acids as an important part of their diets.
- A theme you encountered in previous science courses and will continue to explore in Science 30 is the notion that a technological solution to a problem often creates an unintended set of new problems. Identify what problem is addressed by having people increase the marine sources of omega-3 fatty acids in their diets.
 - List some unintended new problems that could arise from this technological solution.
 - How might some of the unintended problems identified in 42.b. be solved?
43. Refer to question 42. Some people argue that many of the difficulties created by technological fixes to problems stem from the fact that science can sometimes be characterized as “knowing more and more about less and less.” In other words, science and technology can become intensely focused on the minute details of an extremely narrow field of study, and sometimes the “big picture” gets lost in the details.
- Review the definition for traditional ecological knowledge. How does this point of view help keep the “big picture” in focus?
 - Comment on the possible benefits of integrating scientific research with traditional ecological knowledge.
44. Obtain a copy of the handout “Cardiovascular Disease Risk Questionnaire” from the Science 30 Textbook CD. Complete the questionnaire.



Add the completed questionnaire to your health file.

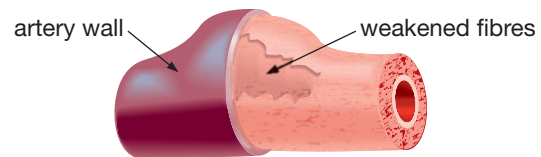
Other Cardiovascular Diseases

Not all cardiovascular diseases have their causes tightly linked to the effects of cholesterol and the types of fat present in a person's diet. Many cardiovascular diseases are due to injuries, conditions present at the time of birth, or a number of other factors.

Aneurysm

Have you ever turned on a garden hose and then bent the hose or pinched off the end of it so that the water couldn't come out? You might have noticed that pressure increased in the hose before the blockage. This extra pressure could cause the tough plastic surrounding the hose to weaken, bulge, and eventually tear. A stretched weakness in a blood vessel is called an **aneurysm**. An aneurysm can happen in any blood vessel, but it occurs most often in the aorta where blood pressure is highest. Sometimes an aneurysm is due to disease or injury, or it may be present from birth. Having an aneurysm is a dangerous condition because the stretched vessel wall is weak and could burst, causing internal bleeding. A ruptured aneurysm in the brain can cause a stroke or death. The development of an aneurysm can be caused by hypertension and atherosclerosis, but certain people have this condition at birth. An aneurysm is usually repaired by surgery, assuming the patient lives long enough to get surgery.

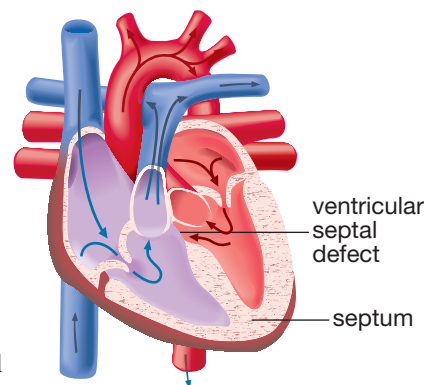
Aneurysm



- ▶ **aneurysm:** a widening or bulging of a blood vessel due to a weakening of the vessel wall
- ▶ **septal defect:** a condition where the opening between the left and right halves of the heart fails to close before birth, causing excess blood to be pumped to the lungs

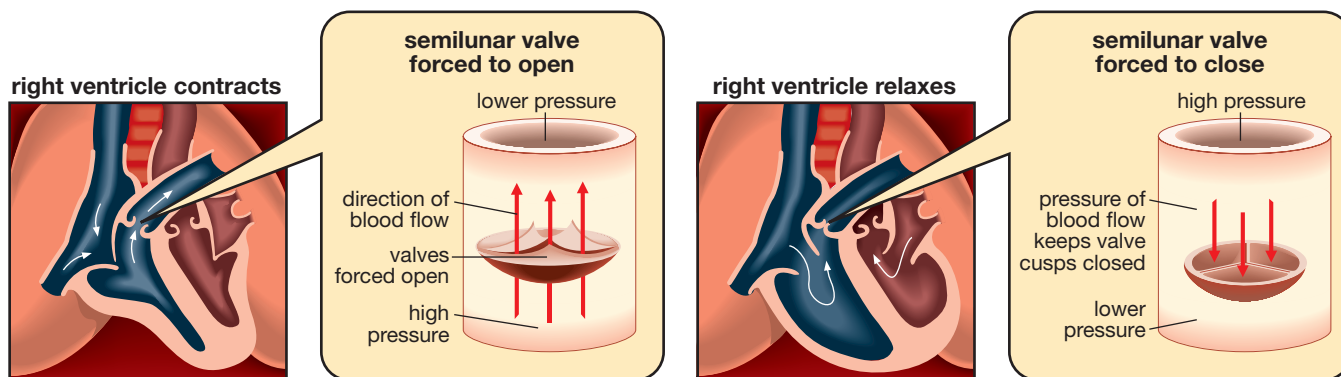
Septal Defect

When a fetus is developing in the womb, its blood doesn't need to go to its lungs to be oxygenated because the baby gets its oxygen from the mother's umbilical cord. Blood circulation in the fetal heart bypasses the lungs through an opening in the septum at the two atria—the top heart chambers. Before the baby is born, the hole between the two heart halves closes up. Occasionally, a baby will be born with a “hole in its heart.” This **septal defect** causes some blood to flow into the right side of the heart, and excess blood is pumped to the lungs. The baby's septal defect usually closes up on its own, but larger holes often need surgery to be properly sealed.



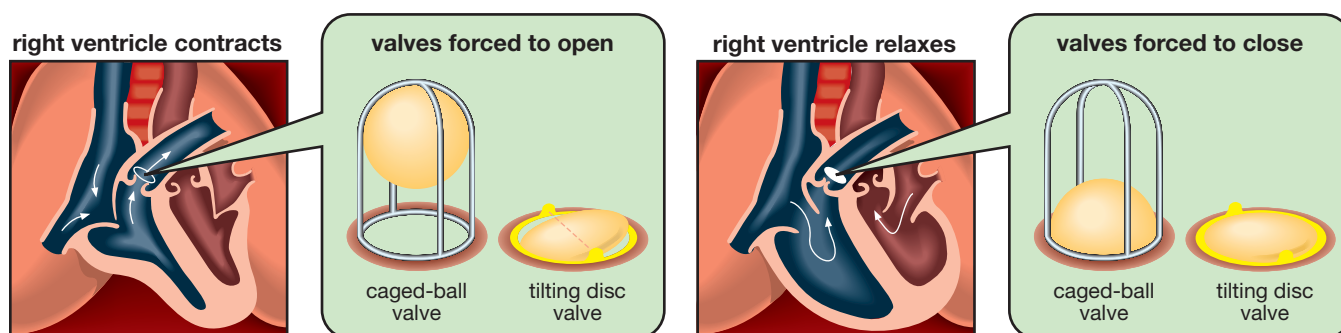
Valvular Heart Disease

Natural Heart Valves



Heart valves are used to control the direction of the flow of blood. If the valves don't close properly, blood can *backwash* against the direction of blood flow. If the valves are too narrow, insufficient blood is passed between the chambers and the heart must work much harder to circulate the required amount of blood.

Replacement Heart Valves



If a defective heart valve cannot be repaired, it is often replaced with an artificial valve or a valve made from human tissue or animal tissue. Artificial valves made from plastic or metal last for a long time but may cause blood clots. Recipients of artificial valves often have to take blood thinners for the rest of their lives. Valves made from human or animal tissue do not last as long as artificial replacements, but they pose less risk for the formation of blood clots.

1.4 Summary

Diseases or disorders of the heart and blood vessels that impair the functioning of the cardiovascular system are called cardiovascular diseases. Your risk for developing a cardiovascular disease may depend upon inherited genetic factors and lifestyle choices.

Atherosclerosis is a condition where a buildup of fatty substances, called plaque, coat the lining of arteries. This results in impaired circulation and heart pain (angina). Atherosclerosis can lead to the production of blood clots and even a vessel blockage. A blood clot in the coronary artery can cause a heart attack or, if it's located in the arteries leading to the brain, can cause a stroke.

Lifestyle factors that increase a person's risk of developing a circulatory disease include high blood cholesterol, high blood pressure, being overweight or inactive, smoking, high stress levels, and excessive alcohol use. Other cardiovascular diseases include aneurysms, valvular heart disease, and septal defect.

The traditional ecological knowledge of Inuit people has helped initiate scientific research. The fact that there is such a low incidence of cardiovascular disease among Inuit people who follow a traditional lifestyle—even though their diet is so high in fat—has acted as a trigger for current investigations. The importance of the types of fats and fatty acids in a person's diet is one of the major outcomes of this work.

1.4 Questions

Knowledge

1. Match each of the following terms with a description of its circulatory problem.
 - plaque
 - atherosclerosis
 - angina
 - heart attack
 - stroke
 - aneurysm
 - septal defect
- a. a chest pain during exertion due to constricted coronary arteries
- b. a death of brain cells due to a blood clot in an artery supplying the brain with blood
- c. a hole between the two halves of the heart that hasn't yet closed after birth
- d. a hardening of the arteries due to a buildup of plaque in the vessel
- e. a material with a rough, hard surface that forms on the inside of arteries due to the buildup of cholesterol and fatty substances
- f. a condition that is caused by a blockage in the coronary arteries
- g. a weakened bulge in a blood vessel that could rupture

Applying Concepts

2. A woman with a family history of heart and circulatory problems visits her doctor. List at least four things the doctor might ask about the patient's lifestyle, and describe changes the doctor might suggest to reduce the risk of the patient developing a circulatory disease.
3. Compare the analogy of a city's water delivery system to the human circulatory system. Explain what the following problems with a water delivery system can be compared to in the human circulatory system.
 - a. Something is stuck in one of the pipes and has caused some homes to lose water service.
 - b. The water pressure is so high that it is putting a strain on the pipes and causing them to leak.
 - c. A valve in the water pump is faulty.

Use the following information to answer questions 4 to 10. First Nations people who live in northern Alberta have acquired traditional ecological knowledge by living in the boreal forest for thousands of years. One element within this vast body of knowledge is that moose is a valuable source of food because it keeps people healthy. After scientific research, nutritionists have concluded that moose meat is a healthy food. The data in this table compares the nutritional value of raw moose meat to raw beef.

| Nutrient (Serving Size) | Raw Moose Meat (100 g) | Raw Beef (100 g) |
|----------------------------|---------------------------|---------------------|
| energy | 427 kJ | 1163 kJ |
| protein | 22.24 g | 17.48 g |
| total fat | 0.74 g | 22.55 g |
| • saturated fatty acids | 0.22 g | 9.16 g |
| • omega-6 fatty acids | 0.14 g | 0.57 g |
| • omega-3 fatty acids | 0.03 g | 0.23 g |

4. Compare the total fat content to the serving size for both moose meat and beef. Express your answers as a percentage.
5. Account for the difference in food energy between the serving of moose meat and the beef serving.
6. Compare the saturated fat content to the serving size for both moose meat and beef. Express your answers as percentages.
7. Refer to your answers for question 6. Explain the significance of these numbers in terms of the effects on blood cholesterol levels.
8. Compare the omega-6 and the omega-3 fatty acid content to the total fat content for both moose meat and beef. Express your answers as percentages.
9. Refer to your answer to question 8. Explain the significance of these numbers in terms of the effects on blood cholesterol levels.
10. Refer to your answers for questions 4 to 9 to explain why moose meat is a good food choice for reducing the risk factors associated with cardiovascular diseases.